Mare-foal interactions in Peruvian horses and in Peruvian foals raised by surrogate regional mares

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Abstract. We studied mare-foal interactions in two groups of horses to investigate possible differences between them with respect to separation of the foals. One group consisted of Peruvian mares and their foals and another of regional mares used as surrogate mothers to Peruvian foals that had been implanted as embryos. We considered two factors: the distance at which mother and foal remained from one another (within a 5m radius or beyond) and the time the foal spent nursing. Data were obtained from birth to nine months for the first group and from birth to nine weeks for the second group. Pairs from the first group were filmed once a week during the first 12 weeks and once every month thereof . In both groups we observed that the distance between foals and their mothers increased and that nursing decreased over time. Comparison of the two groups showed no statistically significant differences in these two parameters during the first nine weeks. At almost nine months of age, Peruvian foals still remained within a 5m radius of their biological mothers for nearly two-thirds of their time, indicating a long term bond between mothers and their young.
Keywords: Horses; Mare-foal interactions; Peruvian breed; Surrogate mothers

Resumen. *Interacciones entre yeguas y potrillos de caballos peruanos y en potrillos peruanos criados por yeguas regionales sustitutas*. Estudiamos interacciones en yeguas y potrillos de dos grupos de caballos para investigar posibles diferencias entre ellos con respecto a la separación de los potrillos. Un grupo consistía en yeguas peruanas y sus potrillos y otro en yeguas regionales usadas como madres sustitutas para potrillos peruanos que habían sido implantados como embriones. Consideramos dos factores: la distancia a la que se mantenían la madre y el potrillo el uno del otro (dentro de un radio de 5m o más allá) y el tiempo que el potrillo pasaba mamando, desde el nacimiento hasta los nueve meses para el primer grupo y desde el nacimiento hasta nueve semanas para el segundo grupo. Madres y crías fueron filmados una vez por semana durante las primeras 12 semanas y una vez cada mes despues de eso. Encontramos que, en ambos grupos, la distancia entre potrillos y sus madres aumentaba y que el amamantamiento disminuía con el tiempo. Comparamos los dos grupos estadísticamente y no hubo diferencias significativas en estos dos parametros, durante las primeras nueve semanas. Encontramos que los potrillos Peruanos seguían quedando dentro de un radio de 5m de sus madres biológicas casi los dos tercios de su tiempo al alcanzar los nueve meses de edad, indicando un vínculo a largo plazo entre la madre y su cría.

Introduction

Although several studies have reported on mother-young interactions in different breeds of horses, *Equus caballus* (e.g., Duncan et al., 1984; Crowell-Davis, 1985; Estep et al., 1993), to our knowledge this is the first study to date on the Peruvian breed and a unique case of Peruvian foals raised by surrogate regional mothers implanted with the embryos. The surrogate mares were not first time mothers and they were chosen based on their favorable behavior towards previous foals and on good lactation. According to De Ascásubi (1968), the Peruvian breed originated from 3 different breeds, Spanish, Frisona and Berberisco, while Ferrer (1999) proposed that it originated from the Andalusian and Berberisco breeds. The Peruvian breed is mostly known for its special lateral gait, in contrast with the typical transverse gait of most other horses and quadrupeds.

We compare Peruvian foals raised by their biological mothers with Peruvian foals raised by surrogate mothers of another breed with respect to separating from

their mothers. We considered the distances maintained between mothers and their young and also the time the foals spent nursing over a determined period of time.

Materials and methods

Animals and locations

Two different groups of horses were studied. They were observed in relatively large fields where they spent most of their time during the day and night, the mares grazing on local grasses, or resting under an occasional tree, the foals nursing, sometimes trying and eating the different grasses (McDonnell and Poulin, 2002), resting, or frolicking close to their mothers.

One group consisted of Peruvian mares and their foals (location "El Algarrobo", province of Tucumán, Argentina; size 80 hectares). Although there were more than 20 pairs of mothers and foals of different ages in this group, they were not always available for filming (e.g., veterinarian's visit, in preparation for shows or exhibits). Other mares without foals, yearlings and geldings were also present. The actual number of pairs that were filmed and the average time filmed per pair at different age-periods of the foals' lives are given in Table 1.

The second group consisted of surrogate regional mothers and their Peruvian foals (location "Los Copiangos", province of La Rioja, Argentina; size 40 hectares). There were 12 pairs of mothers and foals in this second group. No other horses were present. On many weeks, only 4 pairs or fewer were available for filming. Because of this, and because of the travel distance to the site (about 5hrs), we did not obtain as much data as for the first group. Number of pairs filmed and the average time each pair was filmed per age category are shown in Table 1.

Methods

Over the first 3 months, we filmed (using a video camera Sony Hi8) mare-foal pairs once a week, after which we filmed them once a month. Our goal was to obtain a minimum of 15-minute samples of videotaping per pair and a minimum of two pairs per week, and later per month. For the Peruvian mares with Peruvian foals, we were able to meet this objective until the foals' reached nine months of age, with the exception of the sixth week (table 1). In the case of the surrogate mares with Peruvian foals, we obtained data over a total of five weeks between birth and the ninth week (Table 1).

In order to avoid any confusion in recognizing members of a pair and since distances are hard to evaluate on video, each time we filmed a new pair, we recorded orally, on the video, which pair we were filming and at what distance they were from each other (based on two or three observers' visual estimations and occasionally walking the distance), updating this information as changes occurred. The videos were then analyzed in the laboratory. For each pair we recorded the distance between a foal and its mother every 30 seconds within each video-sample. We used the 5m criterion used by Smith-Funk and Crowell-Davis (1992, also see Tyler, 1972, in Waring, 1983), that is, whether foals were within a 5m radius of their mothers or at more than 5m. We also took note each time a foal was nursing, within a 30-second period for each video-sample.

We calculated percentages of the time each foal spent within a 5m radius of its mother and of the time spent nursing. The Wilcoxon-Mann-Whitney test was used for inter-group comparisons with respect to distance to mother and nursing time during the age categories for which data was available for both groups (Siegel and Castellan, 1988).

Results

We observed between 3 and 10 pairs in the Peruvian-only group for a minimum of 18 to 38 minutes each during the nine months of the study. In the surrogate mother – Peruvian foal group, we observed between 2 and 4 pairs for 40 to 111 minutes per pair in five age categories (Table 1).

Distance to mother

During the first week, foals in the two groups spent 99.5 to 100% of their time within a 5m radius of their mothers (Table 1). This percentage decreased over time although it was not linear. During the fourth week the regional mares with Peruvian foals decreased time spent together within a 5m radius to 71%, but the percentage increased again in the next weeks. The Peruvian mothers with Peruvian foals similarly decreased time spent together within a 5m radius by the fourth week, with minimum values of 71% during the 5th week, but percentage again increased after that. Time spent close to each other, in Peruvian mothers with Peruvian foals, clearly dropped by the sixth month to about two-thirds of their time (Table 1). We found no significant difference between the two groups with respect to this parameter during the weeks for which we had data on both groups (table 1, W_x=28, $p>0.05$, m=5, n=5).

Nursing

Foals from the two groups nursed between 16 and 17% of their time during their first week as seen on videotape (table 1). These values decreased to approximately 5% by 4 weeks of age in both groups. The Peruvian-only group showed some variability, including no observation of nursing during the eleventh week in 6 pairs, each filmed about 20 minutes (table 1). In the following months, nursing was again observed in this group from about 4% to 7.5% to 0% by 8 months. We found no significant difference between the two groups with respect to the time the foals spent suckling during the weeks for which we had data on both groups (table 1, W_x=29, $p>0.05$, m=5, n=5).

Discussion

Tyler (1972, in Waring, 1983) found that foals of the New Forest ponies were within 5m of the mare 94% of the time during their first week. Crowell-Davis (1986) obtained a slightly higher value, 99%. in Welsh ponies. We obtained

Table 1. Mother-young pairs of Peruvian mares - Peruvian foals and surrogate regional mares - Peruvian foals that were filmed (average time in minutes ± one standard error of the mean, 1SE, per pair) from birth to 12 weeks (wk) and from 3 to 9 months (mo) for the first group and from birth to 9 weeks for the second group. N is the number of pairs used per age category. % "0 to 5m" indicates the average percent ± 1SE of time a foal and its mother spent within a 5m radius per age category. % "suckling" shows the average percent ± 1SE of the time a foal spent suckling its mother. Weeks or months for which we had less than 15min of filming per pair or fewer than 2 pairs are not included.

	Peruvian mare - Peruvian foal				Surrogate regional mare - Peruvian foal			
	min filmed per pair		% "0 to 5m"	% "suckling"	min filmed per pair		% "0 to 5m"	% "suckling"
Age of foal	n	mean ± 1SE	mean ± 1SE	mean ± 1SE	n	mean ± 1SE	mean ± 1SE	mean ± 1SE
0 to 1 wk	10	24.7 ± 3.1	99.5 ± 0.4	17.2 ± 2.8	3	40.5 ± 11.6	100 ± 0	15.9 ± 3.6
1 to 2 wk	9	22.2 ± 1.5	95.9 ± 2.4	18.0 ± 3.0				
2 to 3 wk	4	24.4 ± 6.0	90.6 ± 5.6	14.6 ± 6.9	4	88.2 ± 15.9	94.1 ± 2.1	11.6 ± 2.0
3 to 4 wk	6	21.7 ± 2.5	90.5 ± 5.1	11.8 ± 1.9				
4 to 5 wk	6	25.9 ± 4.4	77.1 ± 10.8	6.2 ± 1.4	2	83.7 ± 21.2	70.6 ± 19.4	5.3 ± 1.3
5 to 6 wk	3	25.8 ± 2.1	70.6 ± 10.3	8.5 ± 1.9				
7 to 8 wk	5	21.9 ± 3.1	85.1 ± 7.4	7.6 ± 1.8	3	111.2 ± 4.3	78.2 ± 4.6	6.9 ± 0.3
8 to 9 wk	5	18.5 ± 1.7	80.2 ± 9.8	2.4 ± 1.9	2	100.2 ± 1.7	81.6 ± 1.7	5.3 ± 2.8
9 to 10 wk	3	19.2 ± 1.0	96.6 ± 2.3	5.1 ± 2.8				
10 to 11 wk	4	20.5 ± 1.7	85.2 ± 8.0	8.2 ± 3.9				
11 to 12 wk	6	20.1 ± 1.5	78.3 ±10.7	0 ± 0				
3 to 4 mo	4	25.6 ± 5.8	87.6 ± 7.9	5.2 ± 3.9				
4 to 5 mo	4	21.9 ± 3.6	96.7 ± 3.3	5.4 ± 2.7				
5 to 6 mo	4	18.6 ± 2.5	82.0 ± 10.2	4.3 ± 1.8				
6 to 7 mo	3	38.0 ± 11.1	66.4 ± 23.2	3.9 ± 0.7				
7 to 8 mo	3	27.3 ± 10.4	60.5 ± 25.5	7.5 ± 2.7				
8 to 9 mo	3	20.0 ± 5.0	60.5 ± 19.8	0 ± 0				

similar results in our two groups, 99.5 and 100%, respectively. Foals of both groups then started to spend less time close to their mothers but this decrease was not linear. By the eighth month, foals of the Peruvian-only group still spent a lot of time within a 5m radius of their mothers (60%).

Nursing episodes decreased in the two groups, especially after the first month. This is to be expected and it has been reported in a variety of other breeds, e.g., Tyler (1972, in Waring, 1983) in the New Forest ponies, Duncan et al. (1984) in a band of free-ranging horses from Camargue, France, Crowell-Davis (1985) in Welsh ponies, and Barber and Crowell-Davis (1994) in Belgian horses. We found no significant differences between the two groups with respect to distance to mother and time spent nursing even though in one group the mother was biological and in the other the mother was a surrogate mare from another breed.

Separation of mother and foal is similar among horse breeds (Waring, 1983), including feral horses (Duncan et al., 1984). It has also been reported in Welsh ponies (Crowell-Davis, 1985), in mules (Smith-Funk and Crowell-Davis, 1992), in donkeys (French, 1998) and now in the special case of foals raised by surrogate mothers of another breed. In feral horses, complete weaning occurs toward the end of the first year, usually coincident with the mare giving birth to a new foal (Waring, 1983, and references therein). However, nursing may continue until the foal's second summer if the mother does not foal that year.

Our data agree with findings in reports on other breeds of horses. In the two groups we studied, foals spent about 80% of their time close to their mothers at two months of age, with Peruvian foals raised by their biological mothers maintaining this close contact until 6 months of age after which the time spent with the mother decreased to about two-thirds. These results suggest, on one hand, that separation in horses is similar in many breeds, including the particular case of foals raised by surrogate mothers of another breed, and on the other, that this process is long, at least 8 months or longer, indicating long-term bonding between mares and their foals. This may be important to consider in light of horse management and in particular with respect to appropriate time for weaning.

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